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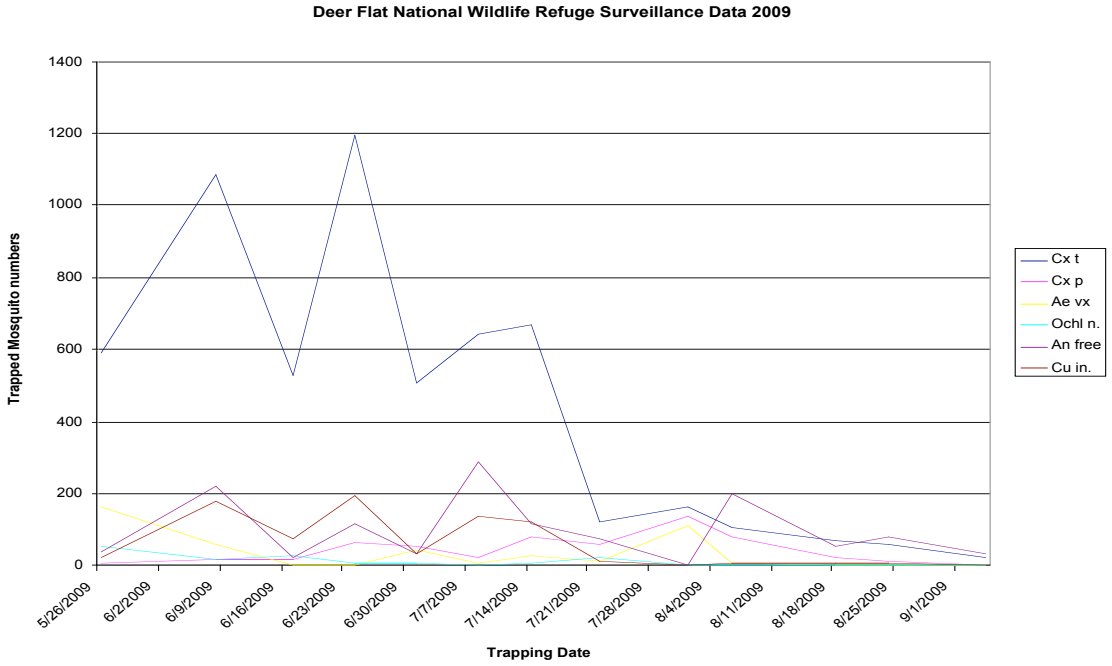
MOSQUITO AND PESTICIDE USE PLAN
DEER FLAT NATIONAL WILDLIFE REFUGE, LAKE LOWELL SECTOR
For 2010

Introduction

The Canyon County Mosquito Abatement District has for eleven years been managing the mosquito population around the Lake Lowell Sector of DFNWR. The presence of Western Equine Encephalitis (WEE) was detected in cattle on ranch property that borders the south boundary of the refuge in 1999. Active arbovirus surveillance in the adult mosquito population was initiated in 2000. In 2006 there was a West Nile Virus outbreak in Idaho. Lake Lowell Sector accounted for 40% of the positive West Nile pools detected and tested in Canyon County during the 2006 epidemic. In 2007 there was no arbovirus activity detected in the adult mosquito population on DFNWR. The main reasons for this were two fold: 1.) Intensified larvicide activity in 2006. 2.) 2007 was a low water year for the reservoir. However Canyon County did have 30 positive WNV pool site locations. This was the most in the state and more than three quarters of the states nation wide. In 2008 mosquito activity on DFNWR was again limited by low water volumes in Lake Lowell and no positive Arbovirus was detected. In 2009, water levels on DFNWR were at the highest level in over five years and many areas that had been dry became flooded. As a result of these high water levels in, the Western Equine Encephalitis mosquito (Culex tarsalis) spiked early in the year and positive West Nile Virus was first detected on June 24.



2009 Surveillance date for DFNWR shows an early spike in the population of Culex tarsalis (BLUE) with positive WNV activity first detected on June 24, 2009.

DFNWR 2009 SURVEILLANCE DATA								
Date				**Species**				
	Cx t	**Cx p**	**Ae vx**	**Ochl n.**	**An free**	**Cu in.**		**Total**
26-May	591	4	161	53	36	23		**868**
8-Jun	1086	16	61	19	220	179		**1581**
17-Jun	530	17	0	27	20	76		**670**
24-Jun	1195	65	3	6	117	196		**1582**
1-Jul	509	55	43	4	33	34		**678**
8-Jul	641	20	4	1	288	135		**1089**
14-Jul	671	78	27	4	116	123		**1019**
22-Jul	122	60	14	22	74	13		**305**
1-Aug	165	137	111	2	0	0		**415**
6-Aug	106	80	4	0	198	7		**395**
18-Aug	67	24	0	1	54	6		**152**
24-Aug	61	14	3	1	80	5		**164**
4-Sep	23	0	0	0	34	0		**57**
	5767	570	431	140	1270	797		**8975**

Above surveillance data chart shows spike in Western Equine Encephalitis Mosquito (Culex tarsalis) . The numbers in red indicate positive West Nile virus mosquito activity.

Species Identification Key

Cx t……Western Equine Encephalitis Mosquito (Culex tarsalis)
Cx p……Northern House Mosquito (Culex pipiens)
Ae vx……..Inland Flood Water Mosquito (Aedes vexans)
Ochl n…….Irrigated Pasture Mosquito (Ochlerotatus nigromaculis)
An free……...Western Malaria Mosquito (Anopheles freebornii)
Cu in……Winter Marsh Mosquito (Culiseta inornata)

CCMAD Integrated Pest Management Principles (I.P.M) for DFNWR

I.P.M is a decision making process that uses all available pest management strategies. This process will help determine what method of control will reduce the mosquito populations to an acceptable level with the least impact to the environment. I.P.M. methods will also weigh the health risk to exposure to pesticides versus the health risk of an arbovirus.

CCMAD-I.P.M. will identify the following strategies for management of mosquito populations: (The explanations of IPM strategies are found starting on page 2 of the CCMAD Comprehensive Mosquito Management Plan that accompanies this document.)

1. Education.
2. Cultural.
3. Mechanical.
4. Biological.
5. Chemical or Pesticide use.
6. Surveillance.
7. Action Thresholds.

Adult Mosquito Monitoring and Surveillance

DFNWR is part of the Lake Lowell Control Sector of CCMAD and is the main source of mosquito populations for this Sector. Mosquito surveillance is conducted for the following reasons:

1. Adult mosquito population dynamics.
2. Species identification.
3. Presence of a mosquito borne disease.
4. Determining Action thresholds.

CCMAD conducts adult mosquito surveillance by deploying CDC CO_2 light baited traps throughout areas of DFNWR. A map of trap deployment is included with this document. Traps are set out two times a week staring in May or sooner depending on weather conditions. Eight to ten traps are deployed per night.

West Nile Virus Testing: Mosquitoes trapped are frozen and identified by species and cataloged. Mosquitoes prepared for testing are divided into testing pools of 50 and tested for West Nile Virus using the R.A.M.P. (Rapid Analytical Measurement Platform) system. The R.A.M.P. system allows for accurate and immediate field testing for West Nile Virus and allows for timely management decisions. Positive mosquito pools are communicated with the Idaho Department of Health and Welfare Bureau of Laboratories. Management decisions to determine action threshold levels are determined by a calculated minimum infection rate of West Nile Virus tested mosquitoes. A calculated M.I.R (minimum infection) is determined by the use of the following formula:

$$\frac{\text{Total \# of positive tested pools}}{\text{Total \# of mosquitoes trapped}} \times 1000 = \text{M.I.R}$$

As defined by the Center for Disease Control, a calculated M.I.R of 5 mosquitoes / 1000 may indicate epidemic levels. The M.I.R ratio of 5/1000 is used by Idaho Public Health Officials as a bench mark number to take emergency action such as region wide aerial adulticide treatments.

Pesticide Use and Action Level Thresholds

To determine pesticide use on DFNWR larval surveillance is first conducted. Larval surveillance locations are noted on the included maps with this document.

Larval Control Action Thresholds: Thresholds are determined by standard mosquito dipping techniques. Dipping is done in open water, along banks, under vegetation, flooded areas, standing water pools that are shallow, catch basins and shoreline habitat.

Density determinations for Culex species (primary disease vectors):

Low: 1-5 larvae per dip.
Medium: 6-10 larvae per dip.
High: > than 10 larvae per dip.

The larvae density action level can be used to determine low much larval control products are to be use or even if any action is to be taken. The following is the Action Level Threshold that CCMAD takes on DFNWR:

Low population density: No action taken.
Medium population density: Use 5-7 lbs. per acre of Bti.
High population density: Use 7-10 lbs. per acre of Bti.

Pesticides Used: Currently only biological control agents are used on DFNWR with the active ingredient Bacillus thuringiensis israelensis.

Bti Agents used:

- Vectobac 12 AS aqueous suspension. EPA reg. no 73049-38
- Vectobac CG granular formulation. EPA reg. no. 73049-19
- Tecknar CG granular formulation. EPA reg. no. 73049-403
- Aquabac xt aqueous suspension. EPA reg. no. 62637-1

Pesticide Methods of Application:

1. Bti liquid products are applied by backpack sprayer or hydraulic power spray equipment if large areas are treated.

2. Bti granular products are applied by hand granular spreaders and backpack power blowers. In areas of limited access by ground or large acreage areas, fixed wing aircraft are used.

Adulticide applications:

At the present time there are no immediate plans to use adulticide materials on DFNWR. To review adulticide application methods and pesticide use refer to CCMAD Comprehensive Mosquito Management Plan submitted with this document.

CCMAD currently uses two mosquito adulticide materials within the district to control adult mosquito populations:

- Malathion ULV, brand name: Fyfanon ULV EPA Reg. No. 67760-34
- Permithrin ULV, brand names: BioMist 4+4 EPA Reg. No. 8329-35
  Kontrol 4-4 EPA Reg. No. 53883-118

Contingency Emergency Mosquito Adulticide Plan:

When M.I.R. numbers reach epidemic levels, CCMAD will submit an emergency adulticide use plan. Any consideration of adulticide materials will be to reduce the infection rate of vector born species such as Culex species for West Nile Virus.

This use plan will involve the use of truck mounted U.L.V. equipment to apply a targeted adulticide application to areas that have elevated M.I.R of 5/1000 and elevated Culex species numbers. This plan will occur over a short period of time (one or two nights). Mosquito population will be monitored and again tested for disease presence. Materials to be used will be from the above list. The total acreage to be treated will be of that that is accessible by ground equipment and not to exceed 1,185 acres. (This figure was computed by mileage measurements of access roads and multiplied by a 300 ft. swath U.L.V. delivery swath.) Emergency adulticide applications will be **considered** when threat level matrix (USFWS suggested matrix) reaches level 6 or level 7. (See proposed threat level matrix below.)

Health Threat Determinations

The following agencies are involved with determining a Health Threat emergency in Canyon County:

1. The Board of County Commissioners. Amended Idaho Statutes (2007) 39-2812 p.1 states that the Board of County Commissioners are authorized to declare a pest or vermin a "Public Health Threat". In 2008 Canyon County was in the second year of a declared emergency by the Board of County Commissioners. This Public Health threat created the Canyon Interim Mosquito District for areas that were not under the jurisdiction of the Canyon County Mosquito Abatement District. An election in November 2008 made the interim district permanent and has merged with CCMAD to create a county wide mosquito control program.

2. Mosquito Abatement Districts. Through field data and mosquito populations monitoring, Canyon County Mosquito Abatement District plays an important role in Health Threat determinations. CCMAD communicates its' field findings with the Idaho State Department of Health and Welfare and Central District Health Department.

3. Idaho State Department of Health and Welfare. The Bureau of Laboratories may be charged with confirmation of positive mosquito testing pools. The BOL mostly relies on field testing data from Mosquito Abatement Districts.

4. Southwest District Health. The primary responsibility of Southwest District Health is to monitor the disease outbreak potential and disseminate information to the public the potential risks of a mosquito borne disease outbreak and preventative measure to take.

Arbovirus History of DFNWR:

In 1999 cattle on ranch property that is adjacent to the southern boundary of DFNWR on Lakeshore Dr. tested positive for Western Equine Encephalitis. In 2006 mosquitoes testing positive for West Nile Virus were discovered early in June. The first confirmed Culex tarsalis pools occurred on June 6 followed by positive pool discovery dates of June

14, 20, 28, July 11, 17, 24, August 15 and 22. In total in 2006 there were 22 positive West Nile Virus pools located on DFNWR Lake Lowell Sector. This was over _ of the total for the County in the epidemic year of 2006. The total cumulative Minimum Infection Rate for DFNWR (M.I.R.) was 12.04/1000. As mentioned earlier in this report the bench mark for taking emergency action is the ratio of 5 infected mosquitoes/1000. In 2007 there were no positive West Nile Virus mosquitoes pools detected on DFNWR. County wide there were however thirty positive pools detected. In 2008 there was no positive West Nile Virus mosquito activity detected from CCMAD surveillance on Deer Flat National Wildlife Refuge. In 2009, West Nile Virus was detected on 5 sites with 5 infected traps. The M.I.R. in 2009 never approached the 5/1000 bench mark.

Arbovirus vector mosquito species detected:

Three primary vectors for West Nile Virus and Western Equine Encephalitis have been identified on DFNWR.

- Culex tarsalis: Common name- Western Encephalitis Mosquito. This species made up over 90% of the primary West Nile Virus vector species.
- Culex pipiens: Common name-Northern House Mosquito. Of lesser importance but a very efficient transmitter of West Nile Virus.
- Culex erythrothorax: Common name-Tulle Mosquito. Populations of this mosquito fluctuate greatly from year to year. It is an efficient transmitter of West Nile Virus especially in bird populations.

Mosquito Borne Threat Level Matrix

The State of Idaho in 2007 Revised West Nile Virus Phased Response Guidance for Counties has defined five levels of response which is included with this document. The USFWS included a Threat Matrix table in their Draft CFR and CCMAD used this matrix in 2008 and 2009. CCMAD will adapt this matrix response again in 2009.

Health Threat Matrix (USFWS Draft CFR):

Health Threat Cat.	Action Level	Threat Level	Response
No documented or historical health threat	No action	1	Remove or manage breeding sites.
Documented historical Health threat.	Below action threshold.	2	Respond as in level 1, also allow surveillance.
	Above Action threshold.	3	Response as in level 1&2 also allow site specific larvicide applications
Documented existing Health Threat	Below Action Thresholds.	4	Response as in threat level 2 plus increase monitoring and disease surveillance.

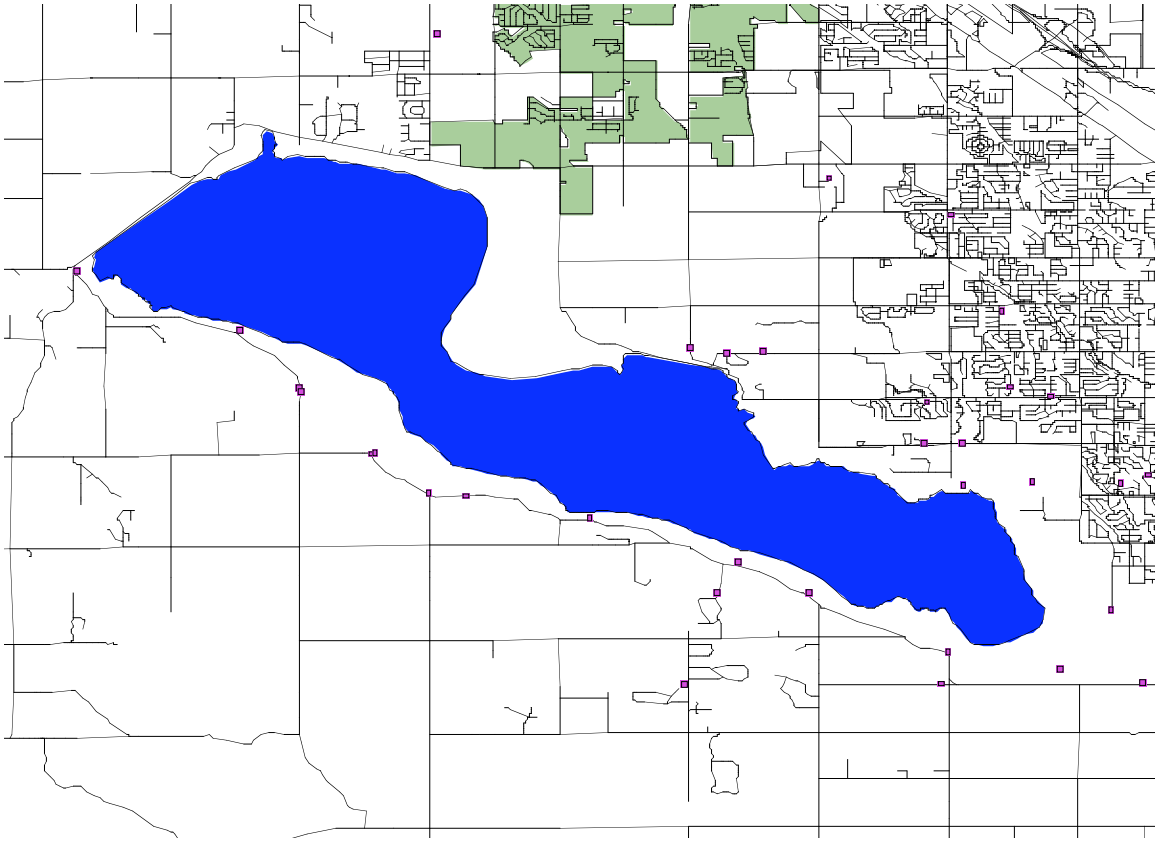
	Above action Thresholds.	5	Response as in level 3 & 4 plus allow site specific larvicide, pupacide or adulticide.
High risk for mosquito borne disease.	Below action threshold.	6	Maximize monitoring and disease surveillance.
	Above action Thresholds.	7	Response as in threat level 6 plus allow site-specific applications of larvicide, pupacide and adulticide.

In 2009 there were 5 positive mosquito pools on 5 different sites. With continued high water levels and high water level carry over into 2010, CCMAD will begin the DFNWR mosquito year at Matrix Level 4 using the above Matrix threat level for DFNWR.

CCMAD Mosquito Management Strategy for Deer Flat National Wildlife Refuge

In 2009, CCMAD will deploy 10 to 12 surveillance traps in DFNWR. These traps will be analyzed weekly and mosquitoes will be tested for WNV and other arbovirus diseases.

Below is an arbovirus surveillance trap location map for 2010.



Larval inspections will begin as weather dictates in the spring and large scale larvicide operations will again be conducted with contract aerial applicator, Valley Air Service from Caldwell, Idaho. USFWS will be contacted before any aerial larvicide applications are performed with information as to where the application will be conducted and how may acres and rate of application of Bti.

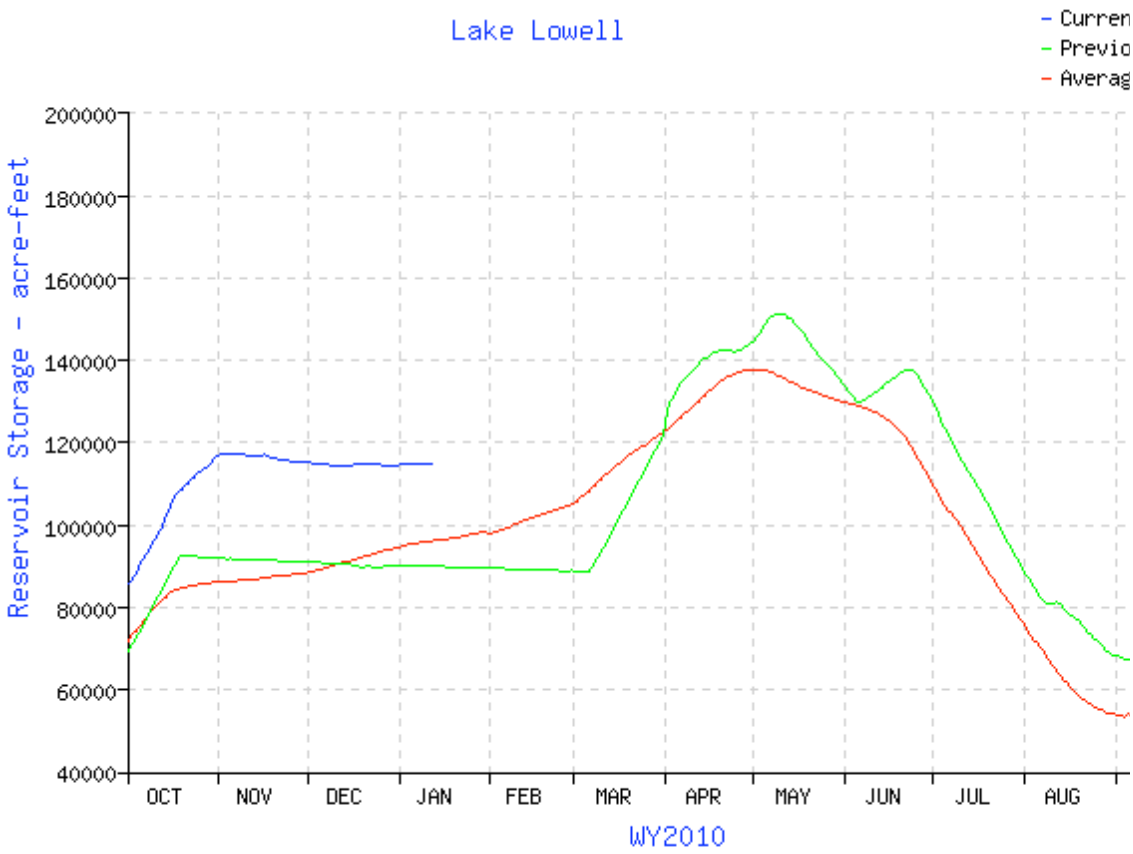
Below is the record for Larvicide operations for 2009 on DFNWR. CCMAD speculates that larvicide operations in 2010 should be similar to 2009.

Application Date	Rate	Acres Treated	Location	Amount Used
May 1	8 lbs/acre	500 acres	DFR Access 2 to Access 8	4000 lbs.
May 19	8 lbs/acre	200 acres	N. Y. Canal inflow to DFR Access 1 and Access 8 (lower embankment dam to DFR Access 5	1600 lbs.
June 5	8 lbs/acre	300 acres	Gott's Point to N.Y. Canal inflow	2400 lbs.
June 17	8 lbs/acre	200 acres	Gott's Point to N.Y. Canal inflow	1600 lbs.
June 26*	8 lbs/acre	200 acres	Access 0 to Access 6	1600 lbs.
June 29*	8 lbs/acre	200 acres	Access 0 to Access 6	1600 lbs.
July 17*	8 lbs/acre	180 acres	Tio Lane Access to Access 1	1440 lbs.
July 28*	10 lbs/acre	220 acres	DFR Marsh DFR Access 8 (lower embankment dam) to Access 6	2200 lbs.
TOTALS		2000 acres treated		14,240 lbs. of Bti applied.

*** Response to Positive West Nile Virus surveillance activity .**

Arbovirus Disease Forecast for 2010:

Blue line: Currant level Green line: 2009 level Red line: Average level



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Current Data Graph

PROVISIONAL DATA - SUBJECT TO C HANGE!
Accessibility

- Water levels of Lake Lowell for the beginning of 2010 Water Year are at above average levels and a History of elevated vector populations.
- Disease levels (West Nile Virus) were at highest level since 2006 epidemic year.
- In 2009 DFNWR accounted for 36% of the WNV tested mosquito pools county wide.
- In 2009 DFNWR accounted for 27% of total positive West Nile virus pools

Respectfully Submitted,

Ed Burnett, Director of Operations